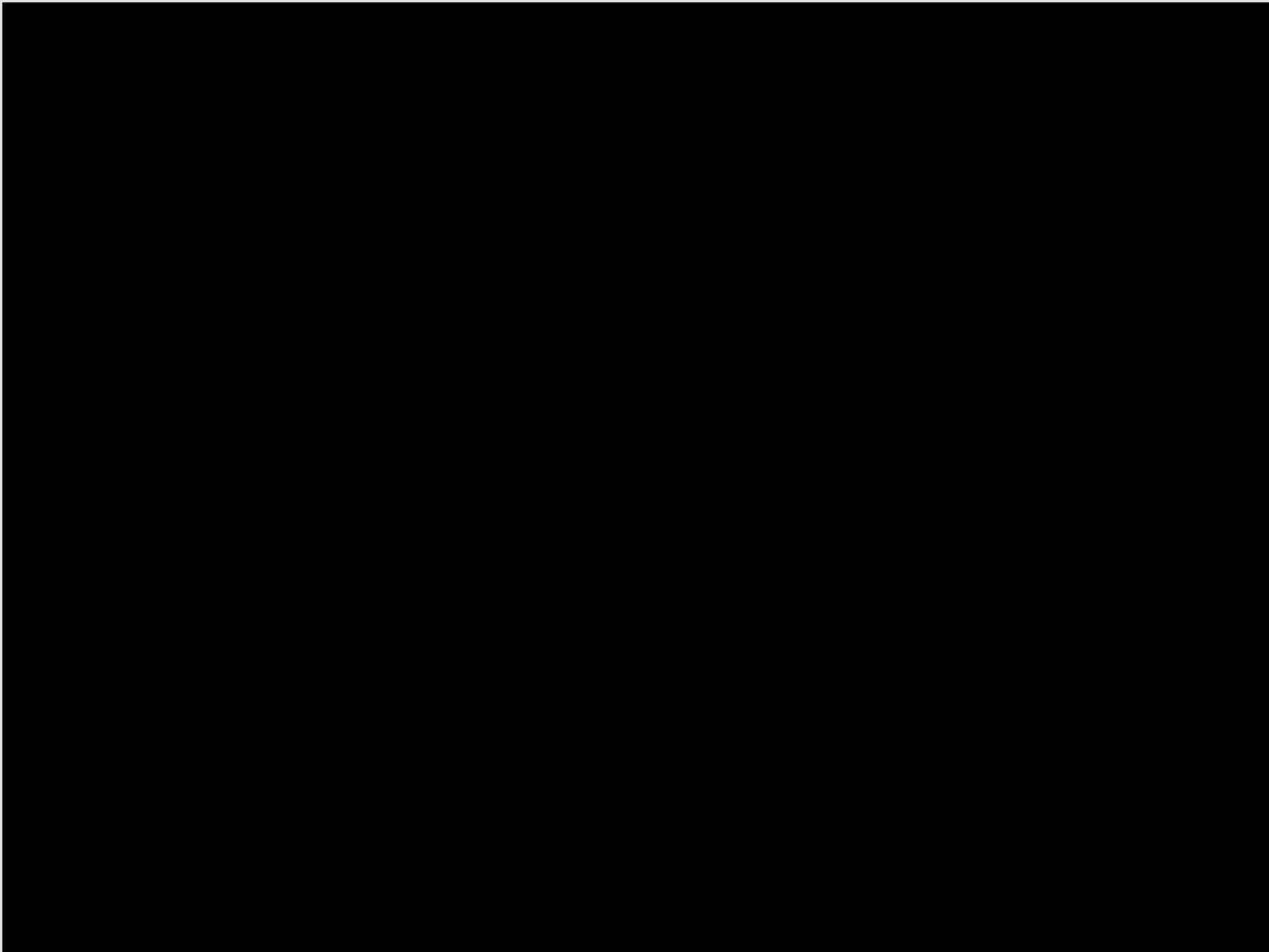


Biological Control of CBB

Next Steps



Peter Follett USDA-ARS Hilo, Hawaii



Predatory flat bark beetles

Background

- Primarily 2 species in coffee berries
 - *Leptophloeus* sp.
 - *Cathartus quadricollis*
- Found throughout Big Island
- Feed on immature CBB
- Not susceptible to Beauveria
- Found mostly in 'raisins' on the tree
- Easy to raise and release



Cracked corn diet

More questions about predators

- Do released predators stay in the field?
- How many CBB do predators eat?
- Can we manipulate behavior to increase the number of predators in coffee fields?

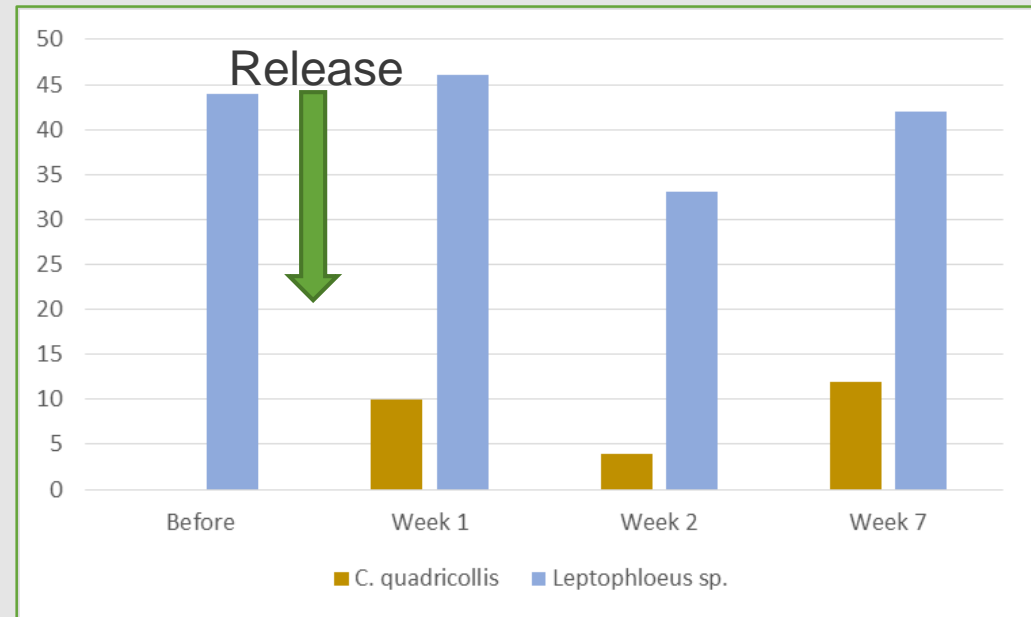


Do released predators stay in the field?

- Released ~10,000 adults on a farm with no previous *Cathartus* (only *Leptophloeus*)
- *Cathartus* was recovered in raisins 1, 2, and 7 weeks post-release



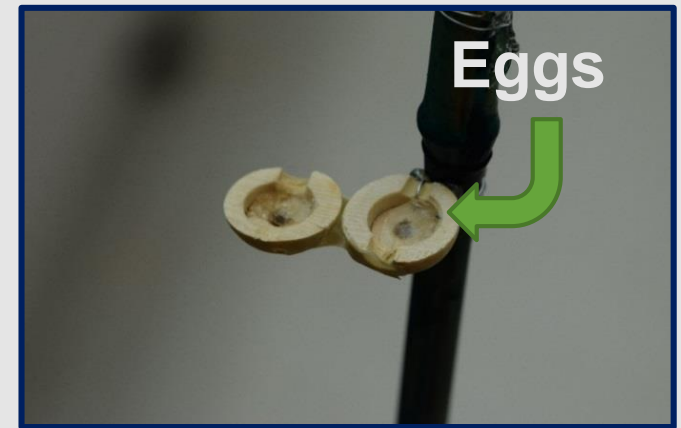
Kimura Iauhala farm, Holualoa



How many CBB do predators eat?

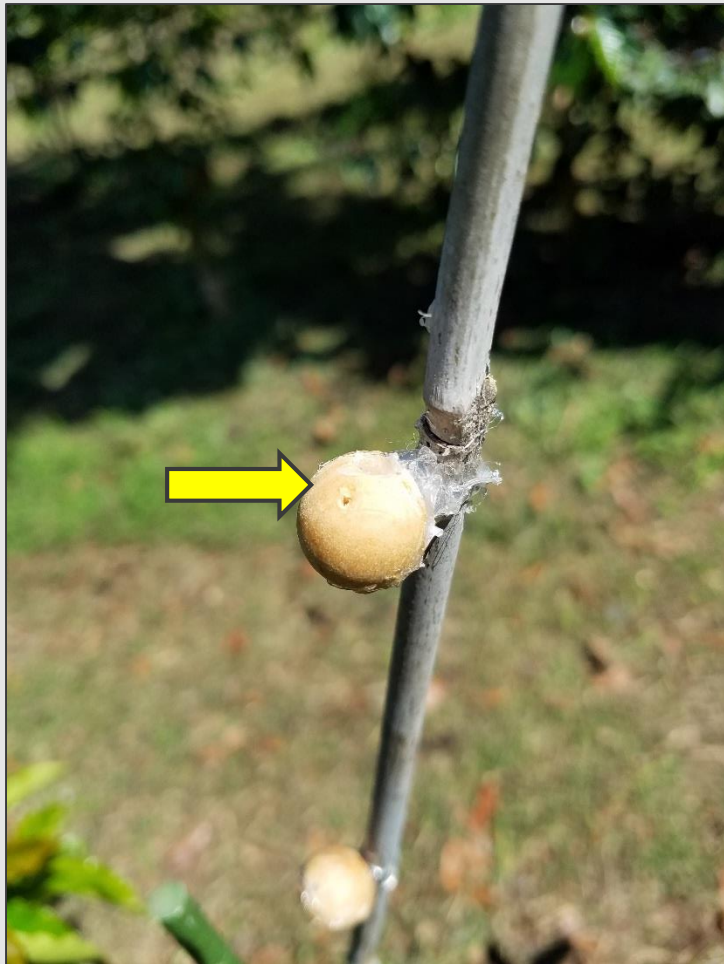
Artificial berries

- Place 20 CBB eggs inside and close
- Hang in coffee farms for 48 hours
- Open and count the eggs that remain



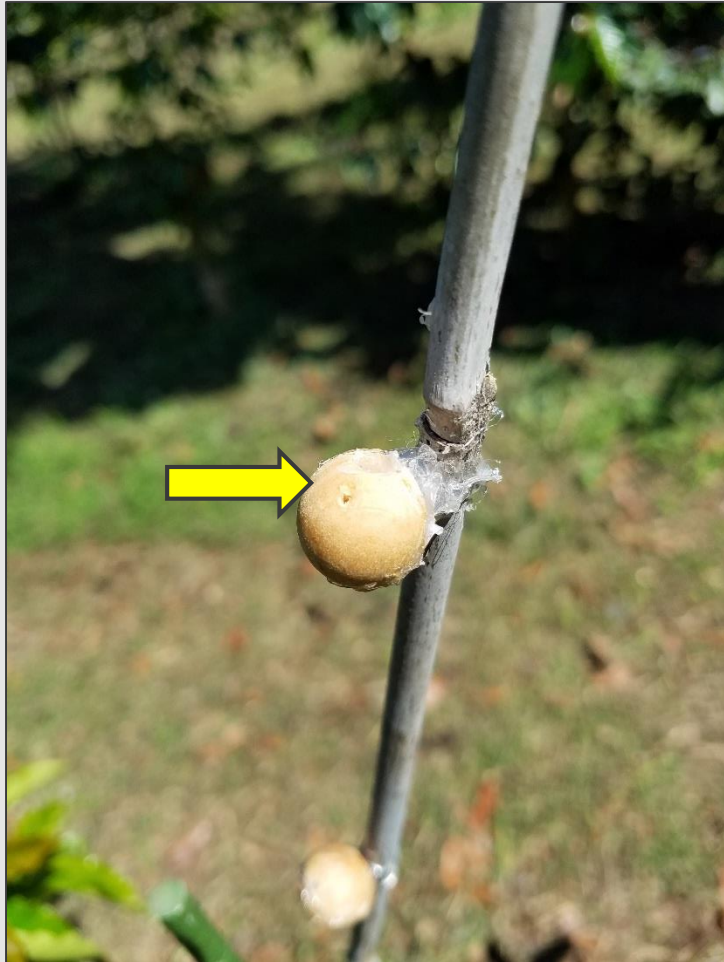
Artificial coffee berries

6 farms – 150 artificial berries = 3000 eggs



Artificial coffee berries

On average **40%** eggs eaten after 48 h





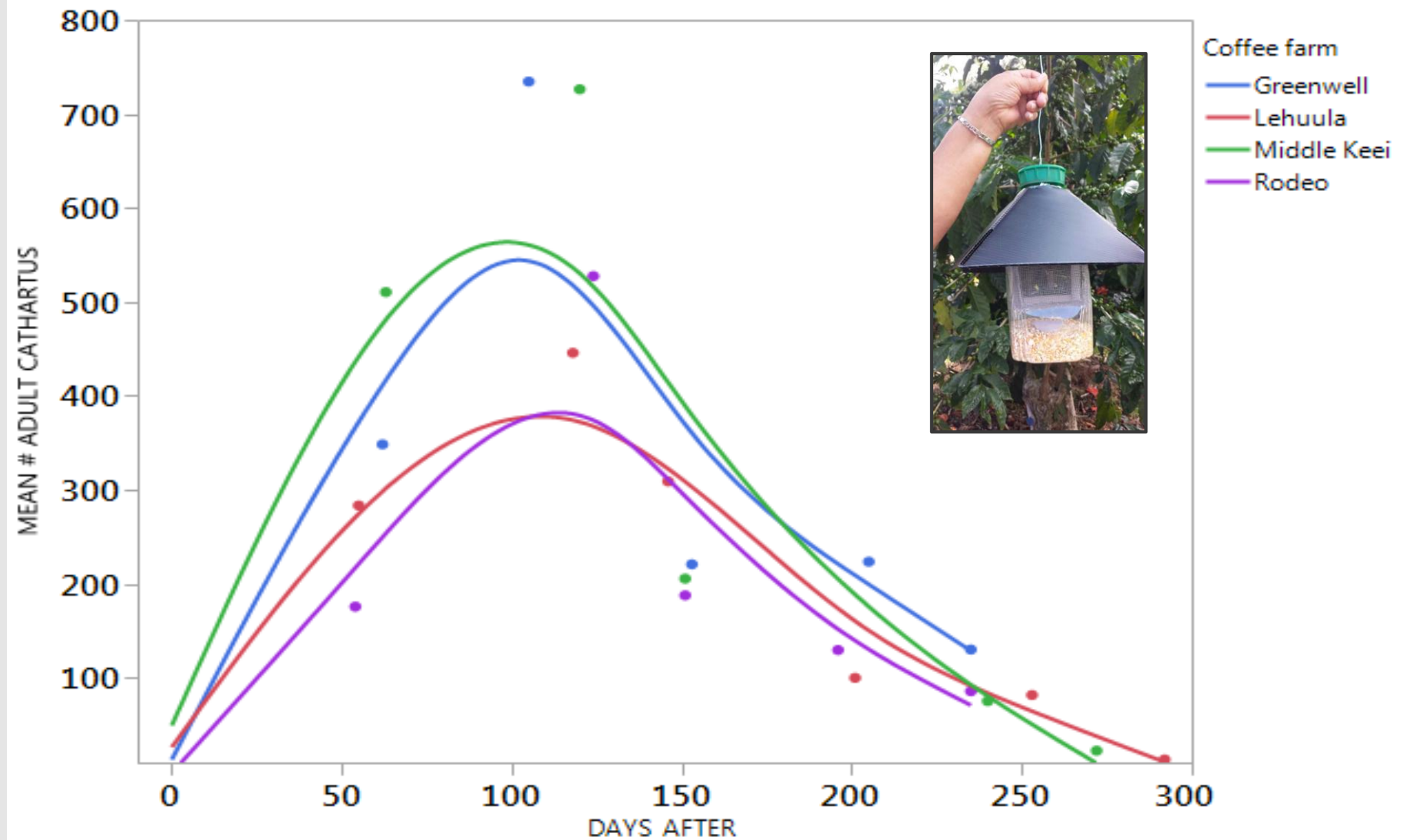
Can we manipulate predator movement?

- ❑ How to raise/release - YouTube videos
- ❑ >250 'starter kits' distributed to farmers

Breeding stations

- Alpha Scents
- Cathartus lures
- Predators attracted to station with food
- Reproduce and multiply
- When food depleted, leave and move into coffee





Over the course of the 2017 season, predators were attracted to breeding stations, multiplied, then moved out, resulting in 100s of additional predators on farms

Breeding stations

Cost \$\$

- 1 stations per acre
- Estimated \$20/acre
- Includes a station and 2 lures (Alpha Scents)

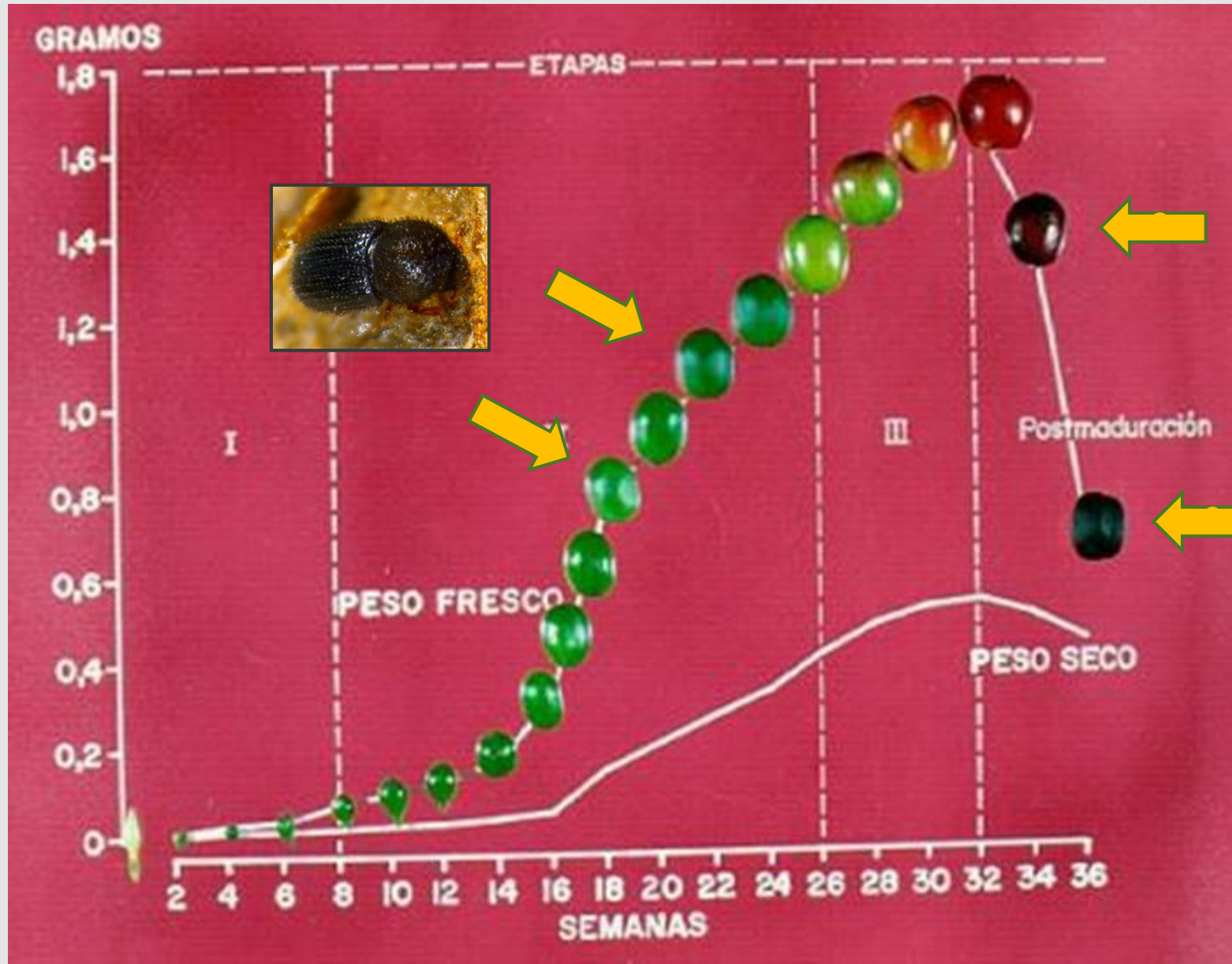
Pheromone lure



Fungal lure



Flat bark beetles not ideal biocontrol!



Coffee berry borer parasitoids

- Adult stage
 - *Phymasticus coffea*
- Larval-pupal stage
 - *Cephalanomia stephanoderis*
 - *Prorops nasuta*



Wasps will attack CBB when CBB is attacking coffee berry



Coffee berry borer biocontrol

Funded by Farm Bill (Hawaii, Puerto Rico)



Research team

- Mark Wright
- Mohsen Ramadan
- Guadalupe Rojas
- Earl Andress
- Peter Follett
- Jose Carlos Verle
- Pablo Benevides
- Yu Takeuchi

Projects

- Existing parasitoids
- Foreign exploration
- Mass rearing
- Mass rearing
- Quarantine evaluation
- Puerto Rico biocontrol
- Source of parasitoids
- Modeling

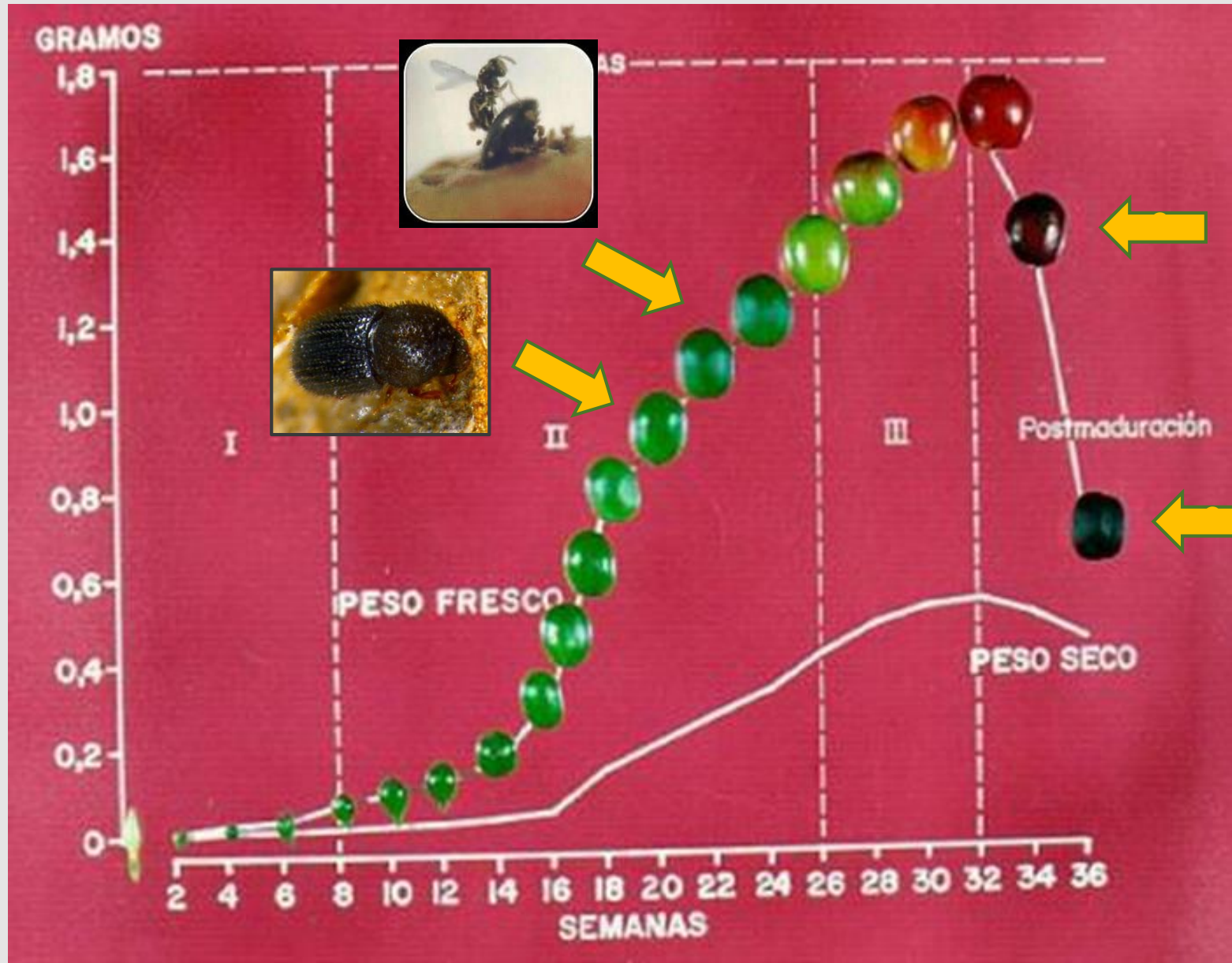
Hawaii - *Phymasticus coffea*

- Host status studies suggest narrow range
- Parasitizes adults
- Endoparasitoid
- Stops CBB reproduction and boring
- Wasp lives 2-3 days
- Up to 50% parasitism



- Released in Central and South America

Parasitoids may help prevent damage



QUESTIONS?

